CLAIMS

What is claimed is:

1. A rotary capping apparatus for applying screw-on type caps to containers, said apparatus comprising:

a primary supporting frame having a plurality of vertical leg members;

a capping head disposed in vertically adjustable relation to said primary supporting frame;

a cap driver assembly including an inflatable gripping means for application of a predetermined torque to said caps, said cap driver assembly being mechanically coupled to said capping head;

primary height adjusting means for imparting vertical movement to said capping head;

a driving means including a servomotor for transmitting a predetermined torque to said cap driver assembly, said driving means being mounted on said height adjusting means and mechanically coupled to said capping head;

container indexing means mechanically attached to said driving means for synchronous advancement of said containers to said cap driver assembly for torquing; and

closed loop controlling means for applying said predetermined torque further including:

(a) a central processing unit for conducting proportional, integral, and derivative control calculations,

(b) an operator console for setting parameters that govern application of said torque transmitted by said cap driver assembly to said caps, and

(a) a servocontroller interfaced for bidirectional communication with said central processing unit, said servocontroller generating an output signal to said servomotor based on the position of said cap driver assembly for torquing said caps such that said predetermined torque is attained.

2. The rotary capping apparatus of Claim 1 wherein said servocontroller is capable of generating a theoretical position profile represented by POS_THEORET(t) and wherein said servocontroller receives position feedback represented by

POS_REAL(t) obtained from an incremental position monitoring device, said POS_REAL(t) being compared to said POS_THEORET(t) and any discrepancy therebetween generating a proportional, integral, and derivative output control signal represented by S(t) and wherein the mathematical relation is expressed as S(t) = POS_THEORT(t) - POS_REAL (t), wherein (t) is a time base, said servocontroller being programmed to automatically set S(t)=0 whenever POS_THEORET(t) - POS_REAL(t) exceeds E_LIMIT wherein E_LIMIT is a programmable parameter governing said predetermined torque.

3. The rotary capping apparatus of Claim 1 wherein said inflatable gripping means includes a elastic gripper disposed about a cylindrical sleeve forming an expandable air chamber therebetween, said chamber being disposed in fluid communication with a source of compressed air such that said gripper is inflatable to engage said caps for application of said torque.

4. The rotary capping apparatus of Claim 3 wherein said expandable air chamber is simultaneously in fluid communication with a vacuum source for evacuation of said air chamber.

5. The rotary capping apparatus of Claim 1 including a secondary supporting frame having adjustable leg members and being disposed adjacent to said primary supporting frame, said secondary supporting frame being isolated from said primary supporting frame to prevent transfer of vibration therebetween.

6. The rotary capping apparatus of Claim 5 wherein said secondary supporting frame includes a cap dispensing means mounted thereon.

7. The rotary capping apparatus of Claim 6 wherein said cap dispensing means is a vibratory cap feeding bowl.

8. The rotary capping apparatus of Claim 6 wherein said cap dispensing means further includes a cap placement station.

9. The rotary capping apparatus of Claim 6 wherein said secondary supporting frame includes automatic secondary height adjusting means.

10. The rotary capping apparatus of Claim 9 wherein said automatic secondary height adjusting means further includes:

(a) a sensing means mounted on said primary height adjusting means in functional alignment with said cap dispensing means,

(b) a servomotor including amplifying means mounted on said secondary supporting frame,

(c) a belt and pulley mechanism driven by said servomotor and engaging said adjustable leg members for raising and lowering said secondary supporting frame, and

(d) a central processing unit for controlling said amplifying means to automatically raise and lower said secondary supporting frame to a predetermined height to process a selected product.

11. The rotary capping apparatus of Claim 10 wherein said sensing means includes an ultrasonic transmitter.

12. The rotary capping apparatus of Claim 1 wherein said capping head further comprises a housing containing a gear mechanism and at least one input shaft having a hollow core for transmission of torque from said driving means to said cap driver assembly, said core being in fluid communication with said gripping means and permitting the flow of compressed air and vacuum thereto.

13. The rotary capping apparatus of Claim 12 wherein said at least one input shaft is mechanically connected to said driving means by an axially extensible spline mechanism that permits simultaneous rotation and vertical extension of said at least one shaft during operation of said driving means.

14. The rotary capping apparatus of Claim 1 wherein said container indexing means further comprises a rotatable starwheel having a plurality of radially disposed slots formed therein for incrementally advancing said containers to said cap driver assembly for torquing.

15. The rotary capping apparatus of Claim 14 wherein said container indexing means further includes a conveying means for delivery of said containers to said rotatable starwheel.

16. An improved rotary capping apparatus for applying screw-on caps to containers, said apparatus including a supporting frame, a capping head disposed in vertically adjustable relation to said frame, a cap driver for application of torque to said

caps, driving means for transmitting a predetermined torque to said cap driver, and container indexing means for delivery of said containers to said cap driver, said improvements comprising:

closed loop controlling means for calculation of said predetermined torque further including:

(a) a central processing unit for setting parameters that govern application of said torque transmitted by said cap driver, and

(b) a servocontroller interfaced for bidirectional communication with said central processing unit, said servocontroller generating an output signal to said driving means based on the position of said cap driver for torquing said caps such that said predetermined torque is attained.

17. The improved rotary capping apparatus of Claim 16 further including inflatable gripping means for torquing said caps.

18. An inflatable gripping device for screw-on type caps for containers comprising:

a cylindrical sleeve having an interior surface and end openings, said sleeve having a plurality of air passages formed therein;

a generally cylindrical elastomeric insert having integral perpendicular overhanging flanges formed at both ends thereof, said insert being disposed within said sleeve in coaxial relation thereto such that said flanges engage said end openings of said sleeve in airtight relation forming an expandable air chamber between said interior surface of said sleeve and said insert; and

a source of compressed air disposed in fluid communication with said air passages such that said insert is inflatable for gripping said caps when positioned within said device.

19. The inflatable gripping device of Claim 18 wherein said expandable air chamber is simultaneously in fluid communication with a vacuum source for evacuation of said air chamber.